U.S. Forest Service
Intermountain Region
Information Paper

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Topic: Management Practices That Increase Carbon Sequestration

RESEARCH

The mission of the Forest Service is to sustain the health, diversity and productivity of the Nation's forests and grasslands to meet the need of present and future generations. The forests here is Utah play a vital role to providing public benefits and services such as clean air, clean water, minerals and energy, timber, forage, fish and wildlife habitat and opportunities for outdoor recreation. With that in mind, we have common interest in managing our range land and forest so they are healthy and resilient to climate change.

Much of the work we are currently doing in climate change and carbon sequestration is happening in our research stations where we have scientists who are recognized nationally and world-wide as leaders in the effort to understand and mitigate climate change. We have three laboratories just in Utah including the Logan Forestry Lab, Ogden Forestry Sciences Lab and the Provo Shrub Sciences Lab.

The work in Provo is of particular interest on the subject of carbon sequestration. Research shows us that intact cold desert shrublands can sequester significant amounts of carbon, both as biomass and in the form of soil organic carbon. In order to gain this important ecosystem service, desert shrublands must be kept intact and prevented from frequent burning. The biggest threat to shrubland integrity is the invasion of exotic annual grasses that increase fire frequency to the point that most shrubs can no longer persist.

As part of the Grassland, Shrubland and Desert Ecosystems Program in the Rocky Mountain Research Station, scientists conduct original research and collaborate with researchers and managers from private and public universities and state, federal, and foreign agencies on aspects of shrub and shrubland biology, ecology, and management. Research focus areas are inter-related and address challenges to shrubland conservation and management under the over-arching realities of a changing climate.

The Rocky Mountain Research Station is looking at the key components of carbon exchange including photosynthesis, soil respiration, and plant productivity across the warm deserts of North America to determine if common trends exist that can be utilized in management. The RMRS is also providing an overview of how management practices can influence carbon sequestration in this region. Since desertification is projected to increase in the future, management strategies that increase carbon sequestration or decrease carbon loss are especially important.

Partnerships between scientists and land managers are being strengthened to improve the focus of research and technology to address current and emerging science and information needs. Resource inventory, monitoring, and assessment activities and decision support tools are being better aligned and coordinated across Forest Service programs and with partner agencies at multiple scales. Our partners, universities, and research are relied upon to provide us with the most appropriate management practices and tools to increase our resource capability to store and manage carbon. We continually look for opportunities to increase carbon management on National Forest lands.

MANAGEMENT

What we learn about climate change through research and best available science informs and influences our management decisions. To help guide us in that area, pursuant to President Obama's Executive Order 13653 – "Preparing the United States for the Impact of Climate Change" the Forest Service developed a Climate Change Adaptation Plan in 2014 which we are currently implementing.

The Forest Service understands that its mission is impacted by shifts in temperature and precipitation patterns and amounts, extreme weather events, and climate variability. Changes in key climate variables affect the seasonality of hydrologic regimes, reproduction cycles of pests and pathogens, and length of fire seasons. For example, fire seasons in the West have increased by 78 days since the mid-1980s.

Disturbance facilitates the introduction and spread of invasive species, which increase extinction risks for native species and other alterations of ecosystem processes and functions. The changing climate is already altering species ranges and has the potential to alter ecosystem structure in the future as evidenced by the mountain pine beetle (a native insect) epidemic in the West.

Management will require forward-looking approaches to novel ecosystems instead of depending on historical ranges of variability. These impacts pose challenges to sustaining forests and grasslands and the supply of goods and services upon which society depends, such as clean drinking water, forest products, outdoor recreation opportunities, and habitat.

The Forest Service approach for adapting to climate change encompasses climate specific strategies across the agency and direct program by program efforts to integrate climate related policies and guidance, where climate change is one of many drivers of change to be considered in sustaining forest and grassland ecosystems.

RANGE

Through our rangeland assessments and monitoring we are determining the health and condition of our rangelands and managing rangelands to maintain or improve the capability to provide vegetation and long term productivity of the soil resources. We are utilizing the best available science to manage rangeland soil and soil carbon resources.

We look for opportunities for rangeland improvement when they are consistent with science and desired conditions for the resource. For example, grazing in conjunction with site restoration may be a tool to help change a vegetation type from a low carbon production species (such as cheat grass) to a higher carbon production ecosystem (such as sagebrush/blue-bunch wheat-grass system).

We are restoring degraded rangelands to increase native plant diversity and increase resistance and resilience to potential climate change, replacing historic disturbance patterns into the landscapes through prescribed fire and vegetative treatments. We are creating carbon stable outputs from management, and increasing our monitoring of management effects to carbon resources through climatic change monitoring in conjunction with other agencies, states, universities, and research facilities.

The Intermountain Region of the US Forest Service manages 556 livestock allotments under 794 active permits in Utah. There are currently nearly seven million acres of grazing allotments on National Forest System lands in Utah. The Region manages the grazing program through a working partnership between agency grazing permittee's and Forest Ranger Districts. Included in this partnership approach are contributions from an array of diverse stake holders. The Intermountain Region supports collaborative management as a valuable tool toward the attainment of rangeland management objectives.

We invite further discussion on this topic by the state of Utah, Forest Service, other land management agencies, university, research and other cooperators so we may collectively move forward with the state of Utah to meet the intent of the executive order.

FORESTED AREAS

Forests can play a role in carbon sequestration and mitigating Carbon Dioxide (CO2) emissions. However, it is not always clear what course of action is needed to meet issues concerning carbon management and other ecosystem services. Forest management is linked to the manipulation of carbon through either carbon sequestration or the use of biomass for other resource needs. For example, there is a trade-off between management activities that decrease the consumption of biomass from a wildfire and meeting other objectives (for example, timber production) and the amount of biomass a site can hold for carbon sequestration.

Forests and forestry have an important role for sequestering carbon and reducing greenhouse gas emissions. Forests can sequester large amounts of carbon in several ways including as carbon sinks in the standing forest and in wood products.

One of the obvious and most important roles for reducing CO2 emissions is avoiding deforestation and keeping forestlands in forests. Storage of carbon in wood products can also have a significant impact in storing carbon and avoiding use of more fossil fuel-intensive products. Preliminary calculations suggest a 20 to 50 percent decrease in fossil fuel use if forests and wood products are used to sequester carbon in place of more fossil fuel-consuming products such as steel, concrete and brick.

Carbon sequestration in forests is one ecosystem service that will be sensitive to climate change, and forest management will be necessary to facilitate forest adaptation as the climate changes. Sustainable forest management can not only maintain carbon sequestration at current levels, but can also increase carbon sequestration to mitigate atmospheric CO2 concentrations. Management practices aimed at mitigating atmospheric CO2 are more likely to be successful if they are specific to different forest types and disturbance. Furthermore, these mitigation strategies will be more effective if they are implemented with consideration of the expected effects of climate change on forest ecosystems given that some degree of climate change is inevitable despite current mitigation actions.

Thinning forests to reduce disturbance severity and extent (fuel treatments) is a forest management practice that can enhance resilience to disturbances, as well as maintain and enhance carbon sequestration. Certain forest management practices may increase the carbon sequestration potential of fuel treatments. Fuel treatments will have greater carbon storage benefits if a small area can be treated to reduce fire severity over a larger area through the strategic placement of treatments on the landscape. Carbon sequestration can also be enhanced with specific uses of the biomass that is removed in treatments. The carbon may be stored for up to 100 years or longer if the material is used in long-lived forest products. Carbon benefits also

increase if the biomass is used as an energy source that is substituted for energy that would otherwise be derived from fossil fuels. Increasing the production of biofuels using biomass removed from thinning forests can increase the carbon benefits of fuel treatments.

Utah Forests have produced an average of 38 million board feet (MBF) each year over the last five years while treating about 48,000 acres per year for fuel reductions. A variety of vegetative restoration needs currently drive forest management in Utah. Spruce beetles have been an issue in Utah Forests for the last 25 years, but they reached epidemic proportions within the last 10 years. Spruce beetles have primarily impacted the central mountains of Utah on the Manti-Lasal, Fishlake, and Dixie National Forests. Mountain pine beetles reached epidemic levels on the north slope of the Uinta Mountains on the Uinta-Wasatch-Cache National Forest over the last decade.

Given these insect epidemics the majority of vegetation treatments in Utah Forests have been focused primarily on salvaging dead spruce and lodgepole pine, or using thinning as a preventive measure to reduce the risk of beetle attacks, where possible. Aspen is also of critical concern because of its ability to support considerable biodiversity. Because aspen has declined by more than 50 percent in recent decades, restoration treatments are currently a critical emphasis in Utah Forests. Additional mechanical treatments, both commercial and non-commercial, prescribed fire, or combination of these, are used to reduce the risk of fire in the Wildland Urban Interface (WUI).

VULNERABILITY ASSESSMENT

The U.S. Forest Service Intermountain Region is beginning a region-wide climate change vulnerability assessment and adaptation action partnership. The assessment will synthesize the best available scientific information to assess the sensitivity of natural resources to a changing climate and develop adaption options that will reduce potentially adverse effects. This project will provide the scientific foundation for operationalizing climate change in planning, ecological restoration, and project management, with applications across a broad range of resources.

Over the next two years, the collaborative will conduct a vulnerability assessment of identified resource areas and develop associated adaptation strategies to enhance resilience and facilitate ecological transitions for the Intermountain Region. We want to establish an effective long-term science-management partnership involving multiple agencies and stakeholders to continually assess climate change science and its implications for biophysical and social resources. We are developing this science-management partnership comprised of key personnel from throughout the region, national forests, national parks, Forest Service research stations, and other organizations. We also to plan to engage the State as well as any other key stakeholders.

Nine focus areas have been outlined for the assessment: physical resources, vegetation resources, terrestrial species, aquatic species, infrastructure, recreational uses, cultural heritage, ecosystem services, and disturbance. Each focus area has a team of dedicated people working toward completing an assessment for their focus area. The assessment and adaptation strategy will be peer reviewed and published in a General Technical Report.